A comparative study of different tropospheric delay solutions applied to GNSS observations of the MOSAiC expedition

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Source: T. Sachs

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Objectives & Material

- Multidisciplinary Drifting Observatory for the Study of Arctic Climate (MOSAiC) 2019/09 to 2020/10
- A multi-GNSS antenna was deployed on the *FS Polarstern*.
- This installation aims mainly at estimating tropospheric delays, a proxy for the determination of atmospheric water vapor content (limited in marine and polar domain)
- The underlying idea of the present study is to evaluate the repeatability of the different products and the overall state-of-the-art accuracy.
- 3 periods: 2020/02, 2020/04, 2020/07

Software & tropospheric model considered

Software	hydrostatic delay	Mapping Function	Mode
GINS [Loyer et al., 2012]	GPT2	VMF	PPP
TRACK [Herring et al., 2006]	GPT	VMF	differential (TRO1 as base, ~1000km)
BERNESE [Dach et al., 2015]	VMF	VMF	PPP
CSRS-PPP [Kouba et al., 2001]	VMF	VMF	PPP

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Software	hydrostatic delay	Mapping Function	std. w.r.t. ERA5 (mm)
GINS [Loyer et al., 2012]	GPT2	VMF	20.82
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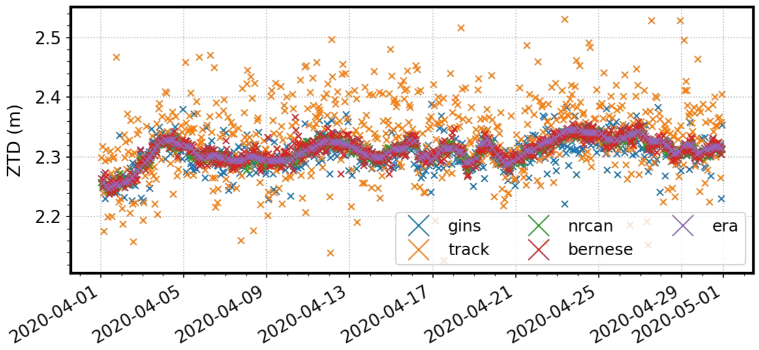
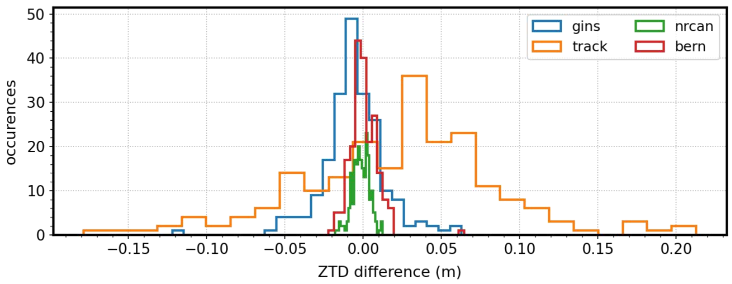
ZTD solutions - April

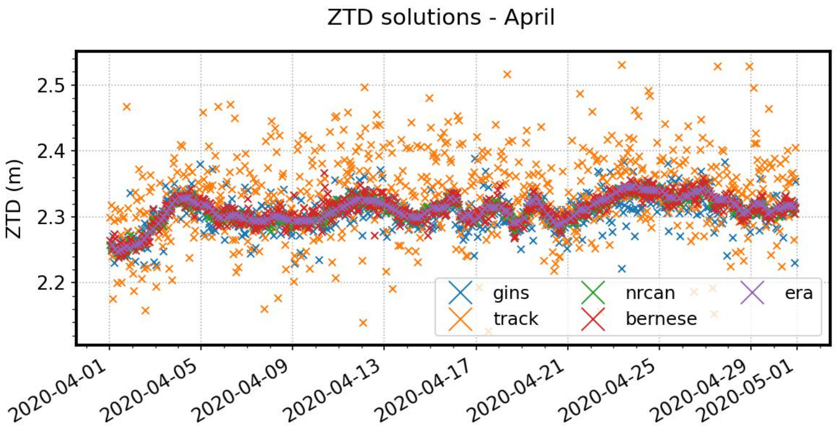


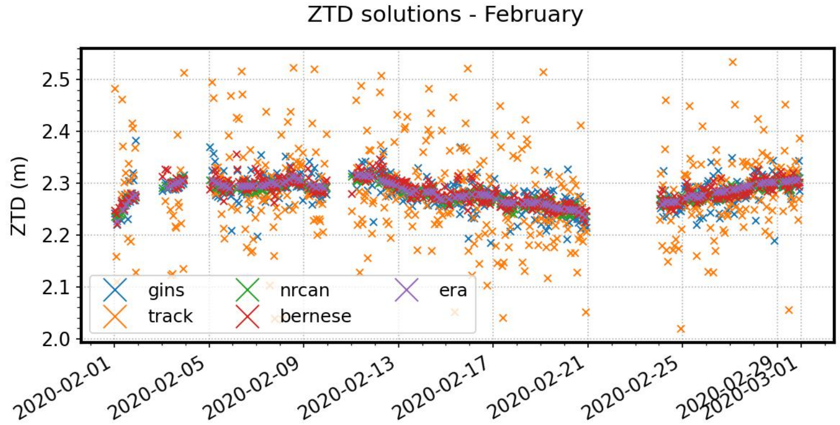
ZTD difference comparison (ERA5 as ref.) - April

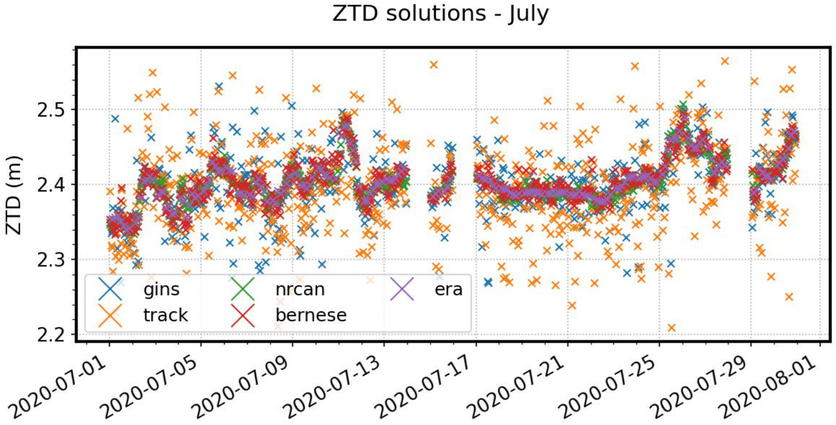


ZTD results

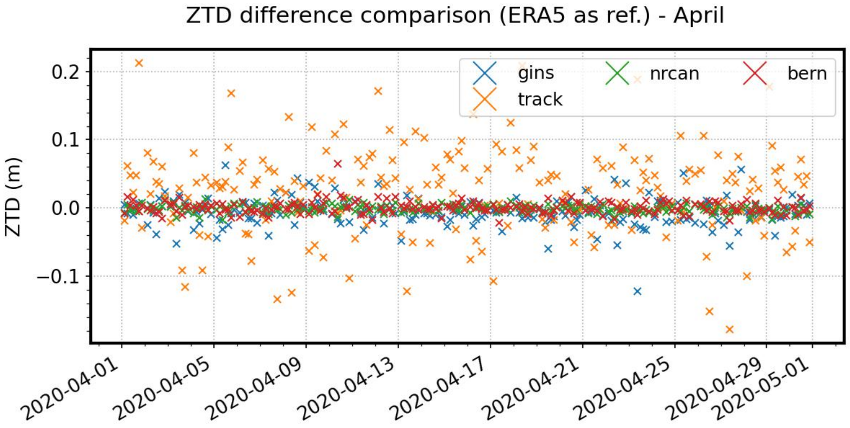
(wet + dry components)

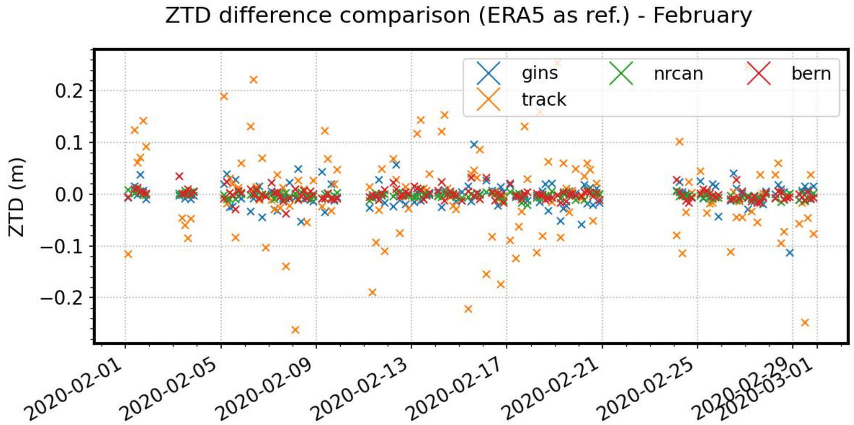


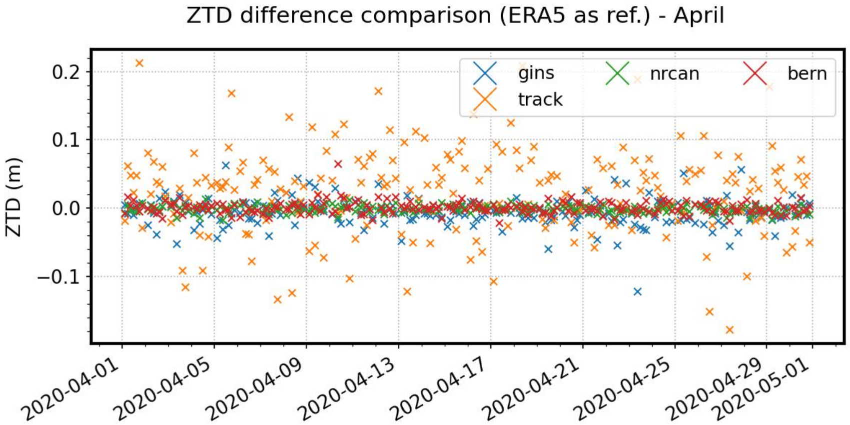




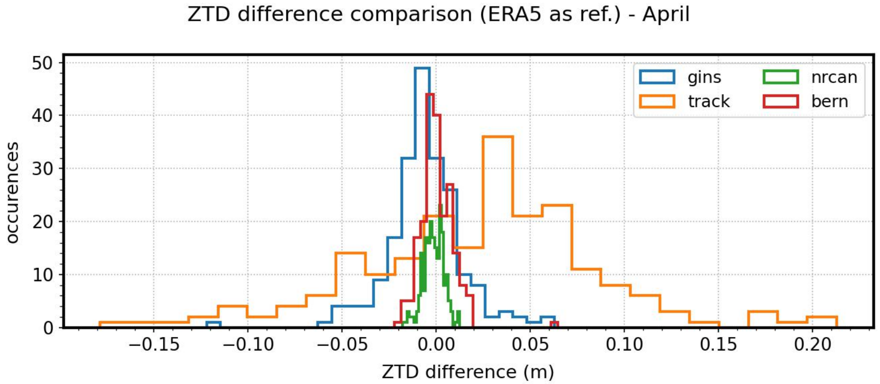
ZTD difference w.r.t. ERA5

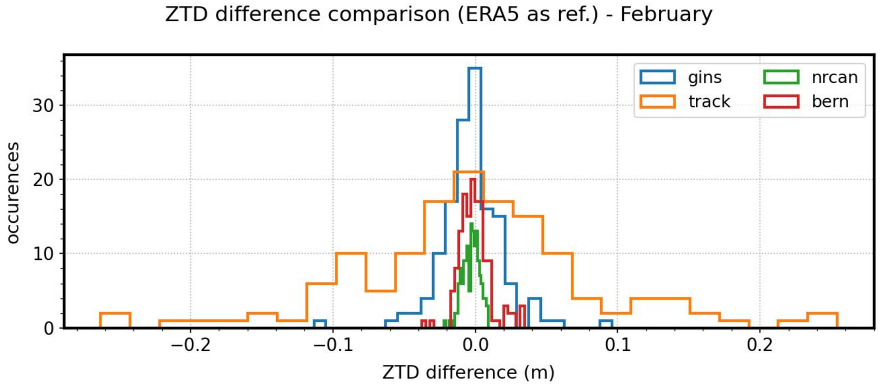


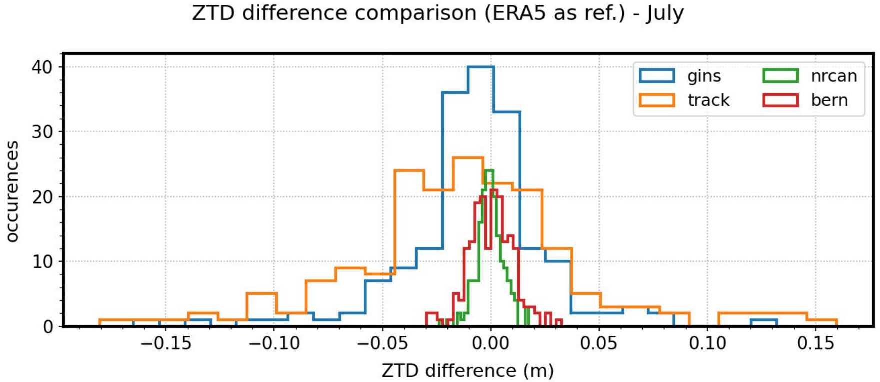




ZTD difference w.r.t. ERA5







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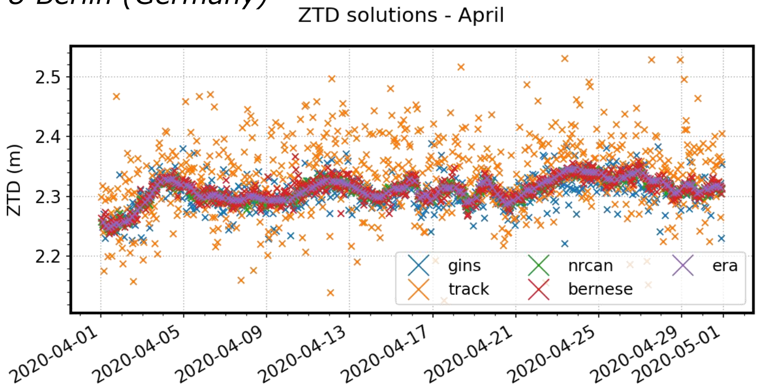

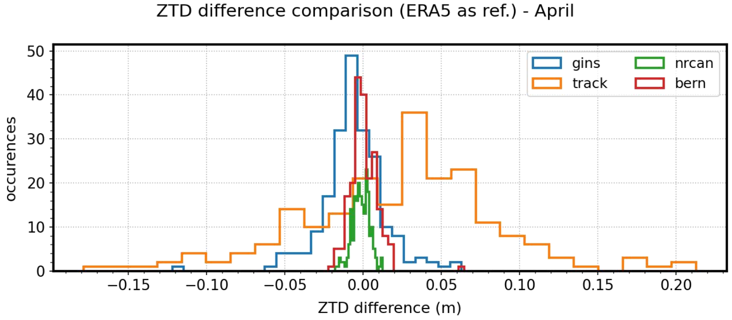

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HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

ZTD mean difference & repeatability w.r.t. ERA5

	February		April		July	
[mm]	*mean*	*std*	*mean*	*std*	*mean*	*std*
GINS	-2.62	22.57	-6.00	20.82	-6.60	34.69
TRACK	-1.83	85.13	23.09	62.90	-12.04	52.72
PPP-NRCAN	-2.80	5.75	-1.33	5.42	-0.33	6.38
BERNESE	-0.73	10.87	0.52	8.95	0.10	10.18

Keypoints

- Very good consistency between CSRS-PPP and Bernese (same VMF hydrostatic model)
- Good compatibility with ERA5 (expected)
- GINS using GPT2 remains compatible especially during February and April
- Differential processing not suited (important dispersion, base too distant)

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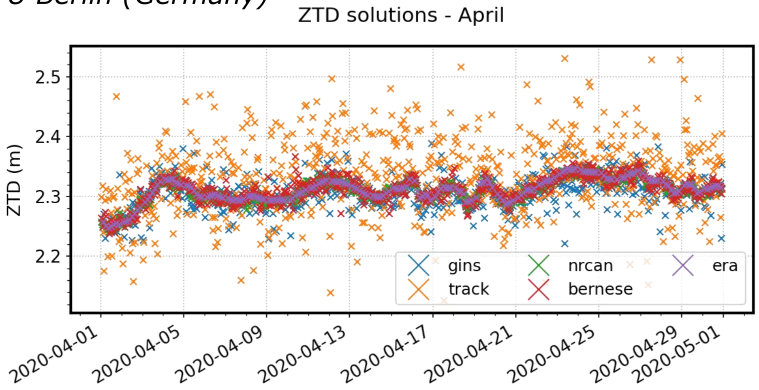

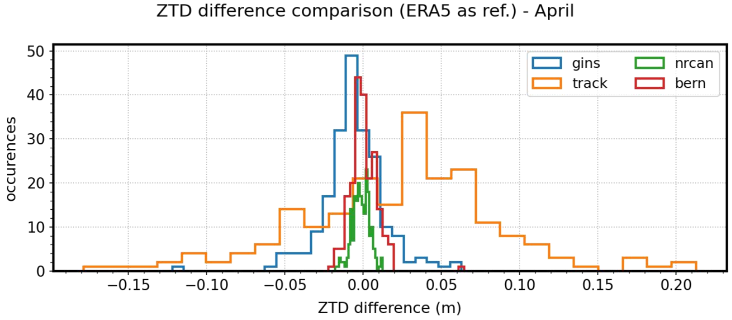

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